Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method of separating species signals in a composite magnetic resonance imaging signal comprising the steps of:

a) applying a series of steady-state free precession (balanced SSFP) pulse sequences, wherein evolution of the steady-state in each balanced SSFP pulse sequence follows a smooth exponential path,

b) measuring magnetic resonance signals during transient periods for the balanced SSFP sequences as steady-state signals evolve, and

c) fitting the transient response of the measured signals to a model to identify the smallest number of discrete exponential terms which provide a satisfactory representation of the measured data, which utilizes a curve-fitting algorithm.

2. (Canceled)

3. (Canceled)

4. (Currently Amended) The method as defined by claim ~~3~~ 1 wherein the curve-fitting algorithm utilizes non-negative least-squares.

5. (Original) The method as defined by claim 4 wherein the model in step c) is defined by:

$$M(t) = \sum_{i=1}^{N} C_i e^{-\frac{t}{\tau_i}} + M_{ss}$$

where $M(t)$ is the signal intensity as a function of time,

N is the number τ points used in the fit,

C_i is relative amount of material with an exponential term constant τ_i,

$M_s s$ is steady-state signal in a voxel, and

τ is the exponential term in the fitting model.

6. (Original) The method as defined by claim 4 wherein a single data frame is acquired repeatedly over decay of the magnetic resonance signals.

7. (Original) The method as defined by claim 6 wherein before step a) a plurality of preparation pulses are applied, wherein an inversion pulse is applied with the preparation pulses and magnetization starts at a negative value.

8. (Original) The method as defined by claim 6 wherein before step a) a plurality of preparation pulses are applied and magnetization is saturated thereby.

9. (Original) The method as defined by claim 6 wherein before step a) a plurality of preparation pulses are applied and magnetization starts in a steady state and is inverted in the steady state.

10. (Original) The method as defined by claim 4 wherein multiple data frames are acquired repeatedly over decay of the magnetic resonance signals.

11. (Original) The method as defined by claim 10 wherein before step a) a plurality of preparation pulses are applied, wherein an inversion pulse is applied with the preparation pulses and magnetization starts at a negative value.

12. (Original) The method as defined by claim 10 wherein before step a) a plurality of preparation pulses are applied and magnetization is saturated thereby.

13. (Original) The method as defined by claim 10 wherein before step a) a plurality of preparation pulses are applied and magnetization starts in a steady state and is inverted in the steady state.

14. (Original) The method as defined by claim 4 wherein before step a) a plurality of preparation pulses are applied, wherein an inversion pulse is applied with the preparation pulses and magnetization starts at a negative value.

15. (Original) The method as defined by claim 4 wherein before step a) a plurality of preparation pulses are applied and magnetization is saturated thereby.

16. (Original) The method as defined by claim 4 wherein before step a) a plurality of preparation pulses are applied and magnetization starts in a steady state and is inverted in the steady state.

17. (Previously Presented) The method as defined by claim 1 wherein the model in step c) is defined by:

$$M(t) = \sum_{i=1}^{N} C_i e^{-\frac{t}{\tau_i}} + M_{ss}$$

where $M(t)$ is the signal intensity as a function of time,

N is the number τ points used in the fit,

C_i is relative amount of material with an exponential term constant τ_i,

M_{ss} is steady-state signal in a voxel, and

τ is the exponential term in the fitting model.

18. (Original) The method as defined by claim 1 wherein before step a) a plurality of preparation pulses are applied, wherein an inversion pulse is applied with the preparation pulses and magnetization starts at a negative value.

19. (Original) The method as defined by claim 1 wherein before step a) a plurality of preparation pulses are applied and magnetization is saturated thereby.

20. (Original) The method as defined by claim 1 wherein before step a) a plurality of preparation pulses are applied and magnetization starts in a steady state and is inverted in the steady state.